Studies of Dust in the Polar Mesosphere

Ingrid Mann[1], Tinna Gunnarsdottir[1], Henriette Trollvik[1], Margaretha Myrvang[1], Dorota Jozwicki[1], Puneet Sharma[1], Peter Dalin[2], Satonori Nozawa[3]

[1]*UiT Arctic University of Norway, Tromsø, Norway*

[2]*Swedish Instute of Space Physics, Kiruna, Sweden*

[3]*Solar-Terrestrial Environment Laboratory, Nagoya University, Japan*

The main dust components in the mesosphere are ice particles, particles that form in the meteor process and mixtures of both. A fraction of the dust and ice particles is electrically charged and through the charge balance influences the chemistry of the mesosphere. The frequency of ice clouds in the mesosphere also indicates temperature trends. Clouds of ice particles, Polar Mesospheric Clouds (PMC) form at heights 80 to 85 km in the mesosphere at mid and high latitude. The charged ice particles contribute to the formation of radar echoes, called Polar Mesospheric Summer Echoes (PMSE). The radar echoes form in regions of atmospheric turbulence and in the presence of charged ice particles. It is assumed that charged mesospheric dust also participates in the formation of similar coherent radar echoes observed at other times during the year, mostly like Polar Mesospheric Winter Echoes (PMWE). Aside from radar observations, the particles are studied from sounding rockets, and optically with lidar and with noctilucent clouds. The observation of meteors and of layers in the atmosphere can help to study the dust formation process from the meteoric material. We discuss the investigation of dust and ice formation and of their interactions using different experiments. The emphasis of the discussion will be in the combination of different observations, and on the prospect to use the EISCAT_3D radar, a new phased-array radar for incoherent scatter and other radar investigations that is at present under construction.